Assessment of the Optimal Withdrawal Strategies of the Nigerian Pension System

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ABSTRACT

The recent pension reforms in Nigeria adopted the defined contribution frameworks for the employees and employers of both public and private sectors. Under this scheme, the investment and longevity risks are transferred to the individual members. This study explores the optimal withdrawal strategy retiree can admit in order to maximise benefits from the Retirement Savings Account. Implications for policy and practice are discussed.

Keywords: Optimal withdrawal strategies, Nigerian pension system, annuity, programmed withdrawal, accumulated contribution, retirement plan, and pension scheme.

1.0   BACKGROUND OF THE STUDY

Retirement benefits planning has been a thing of concern for Nigerians given the failure of past pension schemes. Having a secured post-retirement income is an essential pursuit for workers, policy-makers and the government; failure of which can result in financial instability among a large cohort of retirees and consequently, a financial burden on the society can result.

The right of every employee is to be entitled to some benefits after working for a number of years, which could be in form of gratuity and pension payable to such employee by its employer at the time of retirement. Pension is seen as a monetary sum paid regularly to an individual who is out of service due to disability, old age or retirement, or to his dependents as a result of death of the individual by the state, former employers or from the provident fund to which he and his employer both contributed. Primarily, the objective is to provide post-retirement income and prevent old age poverty (PRA, 2004).

In Nigeria, the accumulated savings of retirees would be insufficient to fund fifty percent of their pre-retirement earnings in the light of PRA 2014, and as stated by Munnel *et al.* (2007), about 45 percent of employed individuals might not be able to sustain their standard of living after retirement. As a matter of fact, as advancement in the medical field elongates life expectancy, the savings gap of workers broadens.

The insurance and pension sector must position themselves to provide innovative and prompt solutions to solve challenges associated with retirement savings such as accumulated fund shortages, fund distribution and longevity uncertainties that workers at the verge of retirement seek answers to. The features and benefits offered by their product or service designs should be able to facilitate a more aggressive investment option yet

secure, than conventional knowledge formerly deemed worthwhile. Also, improved withdrawal options or products on annuity, lump sum and programmed withdrawal options stated in PRA (2014) for their accumulated savings should be introduced to ensure that retirees get a regular pension benefits from their savings that will rather outlive them. Against this draw-downs, this study assesses and examines the optimal withdrawal strategies from the Nigerian pension system. Specifically, it will assess the minimum rate on investment that is required to purchase a lifetime annuity to cater for the annual retirement benefits and show the minimum rate on investment yield needed to be achieved in order to opt for programmed withdrawal to cater for the annual retirement benefits for their lifetime as stated in Nigeria Pension Reform Act (PRA) 2014.

This study will be of great importance to employees, government, insurance sector, the pension industry and professionals, retirees in a way that it will enhance knowledge in pension administration and management in Nigeria. It will enlighten retirees on how to achieve an optimal withdrawal rate of their retirement benefits such that it will last them their lifetime. It will show why authorities should be keenly interested in optimising the withdrawal options made available to retirees.

2.0   CONCEPTUAL REVIEW

The Nigerian pension reform act came into being in 2004 as a result of the failure of the Nigerian pension system prior to the reform. The pension system was bedeviled by a lot of challenges, ranging from embezzlement and non-remittance of pension funds to non-payment of retirement benefits. These challenges necessitated the need for the reform of the pension system which thereby gave birth to the shift from the defined benefits scheme practiced prior to 2004 to the defined contribution scheme currently practiced.

This reform was enacted into law in 2004 which is what is known as the Pension Reform Act (PRA) 2004 with the intention of putting an end to those problems encountered prior to the reform. Its objectives were to assist and ensure employees save towards their old age, to ensure that every individual who worked either in the private or public sector receives their retirement benefits in due time after retirement and to set out rules and regulations for the administration and payment of retirement benefits (PRA, 2004; PRA, 2014; Edogbanya, 2013; Ajiboye, 2011). Nevertheless, this brought about new challenges that led to the improvement of the 2004 act to produce a revised act, PRA 2014.

Withdrawal from an individual retirement savings account (RSA) is subject to some conditions. These conditions as stated in PRA (2014) ensure that an individual must be above 50 years of age or must have retired, whichever comes last, before withdrawals can be effected on their RSA. Restrictions are placed on individuals less than the age of 50 years from withdrawing from their RSA except the individual retires before the stipulated age in accordance with his employment terms and conditions, with regards to permanent disability of the mind or body, or medical incapability making the individual unfit to perform the functions of his office. However, whenever such individual becomes fit to take up an employment, the individual may re-enter the scheme upon securing one (see also PRA, 2004).

The act made provision for an individual to utilise the balance in his retirement savings account for monthly or quarterly programmed withdrawal, for a lump sum withdrawal, or to purchase life annuity (PRA, 2014; Nyong & Duze, 2011).

Lump Sum Withdrawal

According to PRA (2014), a RSA holder can upon the attainment of the age of 50 years or the retirement, whichever is later, withdraw from his RSA account. This withdrawal can be used to fund a lump sum withdrawal provided the leftover from the withdrawal is sufficient to cater for an annuity or a programmed withdrawal for the remaining lifespan of the retiree in line with the issued guidelines by the commission. Thus, if the retirement savings in the RSA account is insufficient and cannot even fund either of a programmed withdrawal, annuity or a combination of both, then the retiree would not be able to make any lump sum withdrawal from his RSA.

Nevertheless, an employee who withdraws from active service as a result of disability or on medical grounds or compulsory retirement and is yet to attain the age of 50 years, may be able to withdraw up to 25% lump sum of the fund in his retirement savings provided he could not secure another employment after three months of his exit from the last employment (Kotun, *et al.*, 2016; PRA, 2014). However, where an employee was dismissed from active service on grounds of irregularities, misconduct or negligence of duty, such will forfeit all the employer's contributions and benefits. However, he will get his own contributions (Kotun, *et al.*, 2016).

Programmed Withdrawals

An employee can opt for a programmed withdrawal with the amount in his RSA paid to him on a monthly or quarterly basis upon the attainment of the age of 50 years or upon retirement, whichever comes last, calculated for an expected life span (PRA, 2014). The programmed withdrawal is a withdrawal option handled by the retiree's PFA which considers the age, final emolument, gender and amount in RSA in the computation of the lump sum and the regular pension payment of retirement benefits to the retiree. The retiree and his PFA shall agree on the sum to be received with the consideration of the maximum and minimum amount that can be received. These benefits are paid for at least eighteen years and are supervised by the National Pension Commission (Kotun, *et al.*, 2016).

Some features of programmed withdrawal as stated in PRA (2014) are that investment yield on a retiree's RSA balance is credited to his RSA and nontaxable. Also, his beneficiaries are entitled to his RSA balance whenever he dies provided there is some amount left in his RSA. Worthy of note is that a retiree who opted for programmed withdrawal has the option to purchase an annuity later if so wished. In addition, a retiree who opted for programmed withdrawal bears the longevity risk.

Annuity

As stated in PRA (2014), at retirement, a retiree can purchase a life annuity from a life insurance company with payments paid on monthly or quarterly basis. The life

insurance company must be licensed by National Insurance Commission (NAICOM) and all procedures must follow the guidelines jointly issued by NAICOM and National Pension Commission (PENCOM).

Annuity withdrawal option is an alternative to the programmed withdrawal option. A retiree can purchase an annuity if he is not interested in programmed withdrawal for whatever reason or even opt for a combination of both withdrawal options. At the purchase of an annuity, a lump sum may not necessarily be paid by the PFA before transferring the balance to the insurance company except the retiree ask for it. Kotun, *et al*. (2016) added that although annuity is for life but it is guaranteed for a ten year period.

Unlike programmed withdrawal, the annuity purchased by a retiree is managed by the insurance company who is expected to bear the longevity risk and pay the retiree by installment for life. Also, this annuitant cannot change to programmed withdrawal after purchasing an annuity but can move from one insurance company to the other after two years. There is the risk of forfeiture if a retiree dies after the guaranteed period, that is, no transfer to beneficiaries. In addition, investment yield belongs to the annuity pool and is kept with the insurance company.

3.0 MATERIAL AND METHODS

3.1 Data

The data used for this study is the accumulated fund of the salary of the individual staff members of the University of Lagos which comprise of the academic, non-academic and technology staff members. Based on this accumulated fund, various withdrawal methods were analysed with respect to PRA 2014 withdrawal guidelines, then the best withdrawal method identified.

3.2 Data Description

The data on accumulated funds used for this study was the funds gathered from the year of entry into employment in the university to the year of retirement from active service. There were different entry ages ranging from entry age-25 to entry age-35, while the exit age is the retirement age-65. An individual with entry age 35 would spend 30 years in service and an individual with entry age 25 will spend 40 years in service. The lesser the age of entry into active service, the higher duration of years spent in service and funds accumulated over the period.

Inflation rates were gotten from the Central Bank of Nigeria bulletin for the years 2004 to 2016 since the first pension reform in Nigeria became effective in 2004, while rates for future years (i.e. years after 2016) were forecasted using a forecasting approach (to say, the Auto-regressive Integrated Moving Average model) such that the forecasted values closely fit each data point of the original data. This inflation rates were then considered in building the models for the withdrawal options as stipulated in PRA 2014.

3.3 Method

During an individual's preretirement years, it is assumed that contributions expressed as a percent of monthly earnings will be paid mid-way through each month and that investment income will be generated until retirement age. Allowance was not made for any tax payments on contributions and investment income. In some countries, like Nigeria, the United States, and Canada, contributions and investment income are exempted from tax. The Nigerian pension reform act 2014 clearly states that any interests, profits, dividends, investments and other income accruable to pension funds or asset are not taxable. In addition, withdrawal of voluntary contribution is no longer subject to tax if withdrawn after 5 years. Tax is limited only to the returns on such contributions if withdrawn within 5 years. It should be implied however that where such returns relate to exempt income like interest on government securities, then tax should not apply.

At the point of retirement, the contributory savings by individuals in their RSA would have accumulated to a huge amount in the defined contributory pension scheme. This accumulated value, including the investment returns made on it and the effect of inflation on such accumulated fund was used to opt for desired withdrawal option(s) by the retiree. Equation (1) represents the accumulated value available at retirement age for the provision of retirement income. Let AF_N be an employee's accumulated funds (contributions) after N years in the plan; then:

$$AF_N = [K \sum_{t=0}^{N-1} SAL_t(1 + INT_t) \times \prod_{u=t+1}^{N-1}(1 + INT_u)]/INFL_t \ldots\ldots\ldots(1)$$

where
K = Rate of contributions as a percentage of earnings;
N = Number of years in the plan before retirement;
INT_t = Gross rate of investment return earned in year t;
$INFL_t$ = Inflation rate in year t;
SAL_t = Annual salary in year t.

Withdrawal

Annuity without Lump-sum

Assuming a retiree purchased an annuity payable for life from the age of retirement, be it without lump-sum or inflation-linked, the value of the annuity purchased is expressed as follows.

$$AF_N = P\% \times SAL_{N-1} \times a(x) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

where
$P\%$ = Pension received as a percent of the individual's final salary;
SAL_{N-1} = Salary received in the final year prior to retirement;
$a(x)$ = Whole life annuity factor for the retiree age x (i.e., at retirement)

i.e. $Annuity\ [a(x)] = \sum_{t=1}^{\infty} v^t{}_j p_t;$ ....(3)

$_j p_t$ = Survival probability from time t to $t+j$;
v^t = Discount rate for year t.

Inflation-linked Annuity

The value of the inflation-linked annuity (pension) purchased can be expressed as follows:

$AF_N = P\%\ \text{x} SAL_{N-1} \text{x}\ b(x)$ ....(4)

where
$b(x)$ = Inflation-linked lifetime annuity factor for the retiree age x (i.e., at retirement).

i.e. $Inflation-linked\ annuity\ [b(x)] = \sum_{t=1}^{\infty} v^t{}_j p_t (1 + INFL)^t$ ......(5)

where
$INFL$ = Inflation rate.
Programmed Withdrawal without Lump-sum
In the case where an individual opted for a programmed withdrawal type of pension payable for life from the age of retirement. The value of the pension requested can be expressed as follows:

$PW(x) = P\%\ \text{x} SAL_{N-1}$ ....(6)

$AF_N = \sum_{z=0}^{\infty} PW(x)_z$ (7)

where
$PW(x)$ = Programmed withdrawal for the retiree age x (i.e., at retirement).
z = Number of years after retirement at age x.

Inflation-linked Programmed Withdrawal

In this case, the programmed withdrawal is indexed for inflation from the age of retirement. The value of the pension requested can be expressed as follows:

$AF_N = {(INT_t\ \text{x} PW(x)_z)}/{INFL_t}$ ....(8)

Annuity and Programmed Withdrawal with Lump-sum

Suppose a retiree received a lump sum withdrawal (an RSA holder upon attaining retirement age will be eligible to make a lump sum withdrawal provided that the amount left in the RSA after the lump sum withdrawal is sufficient to purchase an annuity or fund

programmed withdrawals that will produce an amount which is not less than 50% of the RSA holder's total annual remuneration at the date of his retirement. i.e., as lump sum, a retiree is entitled to an amount not less than 25% and not more than 50%) at the point of retirement and the remaining will be used to purchase an annuity payable for life from the age of retirement. The value of the pension purchased can be expressed as follows:

$$AF_N = P\% \text{ x} SAL_{N-1} \text{x } a(x) + LP\% \text{ x} AF_N \dots\dots\dots\dots\dots\dots\dots(13)$$

where
LP% = Lump sum withdrawal as a percent of the accumulated contribution;

Also, supposing the pensioner received a lump sum withdrawal at the point of retirement and the remaining was used to request for a programmed withdrawal payable for life from the age of retirement. The value of the pension requested for can be expressed as follows:

$$AF_N = P\% \text{ x} SAL_{N-1} \text{x } PW(x) + LP\% \text{ x} AF_N \dots\dots\dots\dots\dots\dots\dots(14)$$

Finally, assuming the pensioner received a lump sum withdrawal at the point of retirement and the remaining, a portion was used to purchase longevity annuity payable after m years for life while the rest was used to request for a programmed withdrawal payable from the age of retirement till m years such that the amount to be paid from both the programmed withdrawal and the longevity annuity is the same (i.e. optimal allocation). The value of the pension requested for can be expressed as follows:

$$AF_N = P\% \text{ x} SAL_{N-1} \text{x } b(x) + LP\% \text{ x} AF_N \dots\dots\dots\dots\dots\dots\dots(15)$$

Equation 1 must equate any of the other equations, as the accumulated amount at retirement provides the funds required to purchase a pension at a rate related to the person's age (with or without the reduction of the lump sum based on individual choice). In any individual case, however, there is the parameter K (the rate of contribution). Within a defined contribution fund, K is defined as in the case of pension act (2004) to be 15% for employer and employees combined while 18% in the case of pension act (2014), and the pension can be calculated based on the accumulated funds at retirement. In contrast, within a defined benefit pension fund, the pension percentage is defined (normally ignoring any tax on the pension) so that a recommended rate of K can be calculated using actuarial principles.

The equations above do not make any allowances for taxes on benefits (which vary with individual income) or expenses which may be in respect of initial expenses, regular administration or investment costs, or the costs associated with the purchase of an annuity.

Optimal Withdrawal Option

The optimal withdrawal option is the best withdrawal strategy opted for in order to obtain a maximum withdrawal rate for the retiree's lifetime with minimal investment yield.

4.0   RESULTS AND DISCUSSION

4.1   Results

In this section, the study considered the optimal withdrawal method from the accumulated fund of retirees. Different withdrawal methods were analysed using some basic assumptions such as the retirement duration and the inflation rate, and the best method identified. The retirement duration for retirees was assumed to be 20 years, i.e., it was assumed that on the average a retiree lifespan will be for 20 years such that the retirement benefit will last for that lifespan and the inflation rates assumed was the CBN inflation figures between 2004-2016 and forecasted afterwards (see appendix 1). Following are the analysed withdrawal methods.

Minimum required rate on investment needed to purchase a lifetime annuity (with or without lump-sum) to cater for the annual pension benefits as stated in PRA 2014.

In order to respond to this research question, the table below displays the analysis of the minimum rate on investment yield needed to purchase a lifetime annuity (with or without lump-sum) with the accumulated funds for the payment of annual pension benefits (APB) as stated in PRA 2014.

Table 1: Minimum rate of investment yield at which lifetime Annuity can be purchased in order to cater for the annual pension benefits (i.e. 20 years duration)

Age at entry	Staff status	Lump Sum	Annuity Only		Annuity with Lump-Sum	
			APB[b]	%[#]	APB[b]	%[#]
25	Academic	10910080.60	3017481.48	+1.56	3017481.48	+2.77
	Non-academic	5815945.71	1823602.14	+3.26	1823602.14	+4.63
	Technologists	6390975.90	2001602.16	+3.24	2001602.16	+4.62
26	Academic	10771597.47	3017481.48	+1.73	3017481.48	+2.96
	Non-academic	5701023.41	1823602.14	+3.54	1823602.14	+4.93
	Technologists	6264197.35	2001602.16	+3.52	2001602.16	+4.93
27	Academic	10627887.83	3017481.48	+1.91	3017481.48	+3.16
	Non-academic	5582471.50	1823602.14	+3.83	1823602.14	+5.26
	Technologists	6133297.50	2001602.16	+3.82	2001602.16	+5.25

Age at entry	Staff status	Lump Sum	Annuity Only		Annuity with Lump-Sum	
			APB[b]	%[#]	APB[b]	%[#]
28	Academic	10475418.75	3017481.48	+2.10	3017481.48	+3.38
	Non-academic	5456639.34	1823602.14	+4.16	1823602.14	+5.61
	Technologists	5994228.84	2001602.16	+4.15	2001602.16	+5.61
29	Academic	10315804.45	3017481.48	+2.31	3017481.48	+3.61
	Non-academic	5325658.59	1823602.14	+4.51	1823602.14	+5.99
	Technologists	5849318.41	2001602.16	+4.51	2001602.16	+6.00
30	Academic	10147985.84	3017481.48	+2.53	3017481.48	+3.86
	Non-academic	5188753.68	1823602.14	+4.89	1823602.14	+6.41
	Technologists	5697683.84	2001602.16	+4.89	2001602.16	+6.42
31	Academic	9973332.76	3017481.48	+2.76	3017481.48	+4.12
	Non-academic	5047678.69	1823602.14	+5.30	1823602.14	+6.85
	Technologists	5541243.73	2001602.16	+5.30	2001602.16	+6.86
32	Academic	9788635.91	3017481.48	+3.02	3017481.48	+4.41
	Non-academic	4899639.18	1823602.14	+5.75	1823602.14	+7.33
	Technologists	5376873.81	2001602.16	+5.75	2001602.16	+7.36
33	Academic	9598612.12	3017481.48	+3.29	3017481.48	+4.71
	Non-academic	4749637.16	1823602.14	+6.23	1823602.14	+7.84
	Technologists	5210107.94	2001602.16	+6.24	2001602.16	+7.88
34	Academic	9401254.86	3017481.48	+3.58	3017481.48	+5.04
	Non-academic	4596085.33	1823602.14	+6.74	1823602.14	+8.39
	Technologists	5039171.60	2001602.16	+6.76	2001602.16	+8.43
35	Academic	9195947.67	3017481.48	+3.90	3017481.48	+5.38
	Non-academic	4438858.86	1823602.14	+7.30	1823602.14	+8.98
	Technologists	4863915.25	2001602.16	+7.33	2001602.16	+9.04

[b]APB implies Annual Pension Benefit
[#]Increment of investment yield on inflation rates.
Source: Authors computation

Table 1 above displayed the minimum rate of investment yield at which lifetime Annuity (i.e. a duration of 20 years) can be purchased in order to cater for the annual

pension benefits as stated in PRA 2014, that is, annual pension benefits must be fifty percent of the individual's last annual salary. It can be seen that for the academic staff, the yield on investment ranges from the value of 1.56 above inflation rates to 3.90 above inflation, for the non-academic staff the investment yield ranges from the value of 3.26 to 7.30 above inflation, for the technologists the yield on investment ranges from the value of 3.24 to 7.33 above inflation. When an initial lump sum withdrawal is made at the point of retirement, it can be seen that for the academic staff the yield on investment ranges from the value of 2.77 above inflation rates to 5.38 above inflation; for the non-academic staff the investment yield ranges from the value of 4.63 to 8.98 above inflation; for the technologists, the yield on investment ranges from the value of 4.62 to 9.04 above inflation.

It can be concluded that investment yield on staff members' contributions is between 1.56 and 9.04 above inflation. Hence, investment yield on accumulated contributions must be higher than inflation rates at these rates in order for the annual pension benefits as stated in PRA 2014 to be achieved as this is not the case in Nigeria; inflation rates are usually higher than investment yield on accumulated contributions, which there by reduces the real value of the contributions.

Minimum rate on investment yield needed to opt for programmed withdrawal (with or without lump-sum) in order to cater for the annual pension benefits for their remaining lifetime as stated in PRA 2014.

In order to respond to this research question, Table 7 displays the analysis of the minimum rate on investment yield needed in order to opt for a programmed withdrawal (with or without lump-sum) to cater for the annual pension benefits (APB) as stated in PRA 2014.

Table 2: Investment yield minimal rate used to opt for programmed withdrawal (with or without lump-sum) in order for the accumulated funds to last for the pensioner's lifetime (i.e. 20 years duration)

Age at entry	Staff status	Lump Sum	Programmed Withdrawal Only		Programmed Withdrawal with Lump-Sum	
			APB	%[#]	APB	%[#]
25	Academic	10910080.60	3017481.48	+4.31	3017481.48	+5.66
	Non-academic	5815945.71	1823602.14	+6.20	1823602.14	+7.76
	Technologists	6390975.90	2001602.16	+6.18	2001602.16	+7.75
26	Academic	10771597.47	3017481.48	+4.50	3017481.48	+5.87
	Non-academic	5701023.41	1823602.14	+6.52	1823602.14	+8.11
	Technologists	6264197.35	2001602.16	+6.50	2001602.16	+8.10
27	Academic	10627887.83	3017481.48	+4.69	3017481.48	+6.10
	Non-academic	5582471.50	1823602.14	+6.85	1823602.14	+8.48
	Technologists	6133297.50	2001602.16	+6.84	2001602.16	+8.48

Age at entry	Staff status	Lump Sum	Programmed Withdrawal Only		Programmed Withdrawal with Lump-Sum	
			APB	%#	APB	%#
28	Academic	10475418.75	3017481.48	+4.91	3017481.48	+6.34
	Non-academic	5456639.34	1823602.14	+7.22	1823602.14	+8.89
	Technologists	5994228.84	2001602.16	+7.21	2001602.16	+8.89
29	Academic	10315804.45	3017481.48	+5.14	3017481.48	+6.60
	Non-academic	5325658.59	1823602.14	+7.62	1823602.14	+9.33
	Technologists	5849318.41	2001602.16	+7.61	2001602.16	+9.34
30	Academic	10147985.84	3017481.48	+5.39	3017481.48	+6.88
	Non-academic	5188753.68	1823602.14	+8.06	1823602.14	+9.81
	Technologists	5697683.84	2001602.16	+8.05	2001602.16	+9.82
31	Academic	9973332.76	3017481.48	+5.65	3017481.48	+7.18
	Non-academic	5047678.69	1823602.14	+8.53	1823602.14	+10.33
	Technologists	5541243.73	2001602.16	+8.53	2001602.16	+10.35
32	Academic	9788635.91	3017481.48	+5.94	3017481.48	+7.51
	Non-academic	4899639.18	1823602.14	+9.05	1823602.14	+10.90
	Technologists	5376873.81	2001602.16	+9.05	2001602.16	+10.92
33	Academic	9598612.12	3017481.48	+6.24	3017481.48	+7.86
	Non-academic	4749637.16	1823602.14	+9.60	1823602.14	+11.50
	Technologists	5210107.94	2001602.16	+9.62	2001602.16	+11.54
34	Academic	9401254.86	3017481.48	+6.57	3017481.48	+8.23
	Non-academic	4596085.33	1823602.14	+10.20	1823602.14	+12.15
	Technologists	5039171.60	2001602.16	+10.22	2001602.16	+12.20
35	Academic	9195947.67	3017481.48	+6.93	3017481.48	+8.63
	Non-academic	4438858.86	1823602.14	+10.86	1823602.14	+12.86
	Technologists	4863915.25	2001602.16	+10.89	2001602.16	+12.93

Increment of investment yield on inflation rates.
Source: Authors computation

Table 2 above displayed the minimum rate of investment yield at which programmed withdrawal can be opted for (i.e. a duration of 20 years) can be purchased in order to cater for the annual pension benefits as stated in PRA 2014, that is, annual pension benefits must be fifty percent of the individual's last annual salary. It can be seen that for the academic staff the yield on investment ranges from the value of 4.31 above inflation rates to 6.93 above inflation, for the non-academic staff the investment yield ranges from the value of 6.20 to 10.86 above inflation, for the technologists the yield on investment ranges from the value of 6.18 to 10.89 above inflation. When an initial lump sum withdrawal is made at the point of retirement, it can be seen that for the academic staff the yield on investment ranges from the value of 5.66 above inflation rates to 8.63 above

inflation, for the non-academic staff the investment yield ranges from the value of 7.76 to 12.86 above inflation, for the technologists the yield on investment ranges from the value of 7.75 to 12.93 above inflation.

It can be concluded that investment yield on staff members' contributions is between 4.31 and 12.93 above inflation. Hence, investment yield on accumulated contributions must be higher than inflation rates at these rates in order for the annual pension benefits as stated in PRA 2014 to be achieved.

Minimal investment rate required to opt for both an annuity and a programmed withdrawal (with or without lump-sum) so as to cater for the annual pension benefits consistent with PRA 2014.

Scenario 1: 50 percent of APB to cater for Programmed Withdrawal and the remaining 50 percent to purchase annuity.

In order to respond to this research question, the table below displays the analysis of the minimal investment rate needed to opt for both an annuity and programmed withdrawal (with or without lump-sum) with the accumulated funds so as to cater for the APB in line with PRA 2014.

Table3: Minimal investment rate at which an annuity and a programmed withdrawal (50 percent of accumulated contribution each) can be opted for in order to cater for the annual pension benefits.

Age at entry	Staff status	Lump Sum	Annual Pension Benefit	Without Lump-sum		With Lump-sum	
				PW	An	PW	An
25	Academic	10910080.60	3017481.48	+4.31	+1.56	+5.66	+2.77
	Non-academic	5815945.71	1823602.14	+6.20	+3.26	+7.76	+4.63
	Technologists	6390975.90	2001602.16	+6.18	+3.24	+7.75	+4.62
26	Academic	10771597.47	3017481.48	+4.50	+1.73	+5.87	+2.96
	Non-academic	5701023.41	1823602.14	+6.52	+3.54	+8.11	+4.93
	Technologists	6264197.35	2001602.16	+6.50	+3.52	+8.10	+4.93
27	Academic	10627887.83	3017481.48	+4.69	+1.91	+6.10	+3.16
	Non-academic	5582471.50	1823602.14	+6.85	+3.83	+8.48	+5.26
	Technologists	6133297.50	2001602.16	+6.84	+3.82	+8.48	+5.25
28	Academic	10475418.75	3017481.48	+4.91	+2.10	+6.34	+3.38
	Non-academic	5456639.34	1823602.14	+7.22	+4.16	+8.89	+5.61
	Technologists	5994228.84	2001602.16	+7.21	+4.15	+8.89	+5.61
29	Academic	10315804.45	3017481.48	+5.14	+2.31	+6.60	+3.61
	Non-academic	5325658.59	1823602.14	+7.62	+4.51	+9.33	+5.99
	Technologists	5849318.41	2001602.16	+7.61	+4.51	+9.34	+6.00

Age at entry	Staff status	Lump Sum	Annual Pension Benefit	Without Lump-sum		With Lump-sum	
				PW	An	PW	An
30	Academic	10147985.84	3017481.48	+5.39	+2.53	+6.88	+3.86
	Non-academic	5188753.68	1823602.14	+8.06	+4.89	+9.81	+6.41
	Technologists	5697683.84	2001602.16	+8.05	+4.89	+9.82	+6.42
31	Academic	9973332.76	3017481.48	+5.65	+2.76	+7.18	+4.12
	Non-academic	5047678.69	1823602.14	+8.53	+5.30	+10.33	+6.85
	Technologists	5541243.73	2001602.16	+8.53	+5.30	+10.35	+6.86
32	Academic	9788635.91	3017481.48	+5.94	+3.02	+7.51	+4.41
	Non-academic	4899639.18	1823602.14	+9.05	+5.75	+10.90	+7.33
	Technologists	5376873.81	2001602.16	+9.05	+5.75	+10.92	+7.36
33	Academic	9598612.12	3017481.48	+6.24	+3.29	+7.86	+4.71
	Non-academic	4749637.16	1823602.14	+9.60	+6.23	+11.50	+7.84
	Technologists	5210107.94	2001602.16	+9.62	+6.24	+11.54	+7.88
34	Academic	9401254.86	3017481.48	+6.57	+3.58	+8.23	+5.04
	Non-academic	4596085.33	1823602.14	+10.20	+6.74	+12.15	+8.39
	Technologists	5039171.60	2001602.16	+10.22	+6.76	+12.20	+8.43
35	Academic	9195947.67	3017481.48	+6.93	+3.90	+8.63	+5.38
	Non-academic	4438858.86	1823602.14	+10.86	+7.30	+12.86	+8.98
	Technologists	4863915.25	2001602.16	+10.89	+7.33	+12.93	+9.04

* Including investment yield and inflation rates.

[d] Difference between investment yield and inflation rates.

Source: Authors computation (See Appendix)

The table above displayed the minimum rate of investment yield at which a combination of annuity and programmed withdrawal can be opted for so as to cater for the annual pension benefits as stated in PRA 2014. In this case, 50% of the accumulated contribution was used to opt for programmed withdrawal and the remaining 50% was used to purchase annuity. It can be seen that for all categories of staff members, the adequate investment yield if fifty percent was used to opt for programmed withdrawal remains the same as the yield if the whole accumulated contributions were used. Also, in the case of annuity, yield on investment from fifty percent of accumulated contributions used to purchase an annuity remains the same as the entire amount used on annuity.

Scenario 2: 25 percent of APB to cater Programmed Withdrawal and the remaining 75 percent to purchase annuity.

Table 4. Minimal investment rate at which an annuity and a programmed withdrawal (25 percent of accumulated contribution for programmed withdrawal and 75 percent for annuity) can be opted for in order to cater for the annual pension benefits.

Age at entry	Staff status	Lump Sum	Annual Pension Benefit	Without Lump-sum		With Lump-sum	
				PW	An	PW	An
25	Academic	10910080.60	3017481.48	+4.31	+1.56	+5.66	+2.77
	Non-academic	5815945.71	1823602.14	+6.20	+3.26	+7.76	+4.63
	Technologists	6390975.90	2001602.16	+6.18	+3.24	+7.75	+4.62
26	Academic	10771597.47	3017481.48	+4.50	+1.73	+5.87	+2.96
	Non-academic	5701023.41	1823602.14	+6.52	+3.54	+8.11	+4.93
	Technologists	6264197.35	2001602.16	+6.50	+3.52	+8.10	+4.93
27	Academic	10627887.83	3017481.48	+4.69	+1.91	+6.10	+3.16
	Non-academic	5582471.50	1823602.14	+6.85	+3.83	+8.48	+5.26
	Technologists	6133297.50	2001602.16	+6.84	+3.82	+8.48	+5.25
28	Academic	10475418.75	3017481.48	+4.91	+2.10	+6.34	+3.38
	Non-academic	5456639.34	1823602.14	+7.22	+4.16	+8.89	+5.61
	Technologists	5994228.84	2001602.16	+7.21	+4.15	+8.89	+5.61
29	Academic	10315804.45	3017481.48	+5.14	+2.31	+6.60	+3.61
	Non-academic	5325658.59	1823602.14	+7.62	+4.51	+9.33	+5.99
	Technologists	5849318.41	2001602.16	+7.61	+4.51	+9.34	+6.00
30	Academic	10147985.84	3017481.48	+5.39	+2.53	+6.88	+3.86
	Non-academic	5188753.68	1823602.14	+8.06	+4.89	+9.81	+6.41
	Technologists	5697683.84	2001602.16	+8.05	+4.89	+9.82	+6.42
31	Academic	9973332.76	3017481.48	+5.65	+2.76	+7.18	+4.12
	Non-academic	5047678.69	1823602.14	+8.53	+5.30	+10.33	+6.85
	Technologists	5541243.73	2001602.16	+8.53	+5.30	+10.35	+6.86
32	Academic	9788635.91	3017481.48	+5.94	+3.02	+7.51	+4.41
	Non-academic	4899639.18	1823602.14	+9.05	+5.75	+10.90	+7.33
	Technologists	5376873.81	2001602.16	+9.05	+5.75	+10.92	+7.36
33	Academic	9598612.12	3017481.48	+6.24	+3.29	+7.86	+4.71
	Non-academic	4749637.16	1823602.14	+9.60	+6.23	+11.50	+7.84
	Technologists	5210107.94	2001602.16	+9.62	+6.24	+11.54	+7.88
34	Academic	9401254.86	3017481.48	+6.57	+3.58	+8.23	+5.04
	Non-academic	4596085.33	1823602.14	+10.20	+6.74	+12.15	+8.39
	Technologists	5039171.60	2001602.16	+10.22	+6.76	+12.20	+8.43
35	Academic	9195947.67	3017481.48	+6.93	+3.90	+8.63	+5.38
	Non-academic	4438858.86	1823602.14	+10.86	+7.30	+12.86	+8.98
	Technologists	4863915.25	2001602.16	+10.89	+7.33	+12.93	+9.04

* Including investment yield and inflation rates.
[d] Difference between investment yield and inflation rates.
Source: Authors computation (See Appendix)

The table above shows that for any category of staff member, the yield on investment if twenty-five percent of an individual's accumulated fund was used to opt for programmed withdrawal remains unchanged as the yield if all the accumulated contributions was used. In addition, yield on investment from fifty percent of accumulated contributions used to purchase an annuity equals the yield if the entire amount was used for annuity.

These two cases indicate that irrespective of the fraction invested in either programmed withdrawal or annuity, the rates at which the APB will be achieved as stipulated in PRA 2014 will remain the same as the rates when the entire fraction is invested in either of the two withdrawal options.

4.2   Discussion

It was shown from the analysis above that the investment yield on accumulated contributions when an individual purchases annuity after retirement must be higher than inflation rates for a minimum rate of 1.56 and a maximum rate of 9.04 in order to achieve the annual pension benefits as stipulated in PRA 2014. Also, the yield on investment of accumulated savings that will be able to cater for a retiree of the university who opted for the programmed withdrawal option will lie between 4.31 and 12.93 depending on the year of entry into active service in the university.

However, the option of the retiree opting for both annuity and programmed withdrawal with the accumulated savings contributed during active service years was considered. This paper examined various fractions of the accumulated contributions used to purchase an annuity with the remaining used to opt for programmed withdrawal. Two scenarios were displayed with the first scenario indicating fifty percent of the accumulated contributions used to opt for each of the two withdrawal options, while the second scenario indicates that 75 percent of the accumulated savings was used to purchase an annuity product and the remaining 25 percent was used to opt for programmed withdrawal. Regardless of the fractions used to opt for any of the withdrawal options, the rates of investment yield above inflation for any one of the withdrawal options will be the same as opting for such withdrawal option with all the accumulated savings for it to be adequate and be able to cater for the individual's retirement benefit as stipulated in 2014 pension reform act. That is, the fraction used to opt for programmed withdrawal can only adequately cater for retirement benefits if the investment yield above inflation falls between 4.31 and 12.93 depending on the age of entry, and the fraction used to purchase an annuity product would adequately cater for retirement benefit in accordance with PRA 2014 if it lies between 1.56 and 9.04.

5.0   CONCLUSION

It can be concluded that the investment yield needed to cater for an individual's retirement benefit who opted for the programmed withdrawal option is higher than that needed to purchase an annuity. Although it may be reasonable to opt for both withdrawal options with the accumulated savings so as to reduce one's risk exposure to any of the

withdrawal option, this strategy will not be optimal due to the high investment yield needed for the fraction of the accumulated savings diverted to programmed withdrawal.

As a result, the optimal withdrawal strategy or option is the strategy that requires the minimum yield on investment in order to adequately cater for the retirement benefits of the retiree as stipulated in PRA 2014. Consequentially, the optimal withdrawal option is the annuity option since it requires the minimum investment yield to adequately cater for an individual's retirement benefits with respect to 2014 pension reform act.

Due to the findings from the study, this study hereby recommends the following: government should encourage individual to purchase annuity products with their accumulated savings as it is the optimal withdrawal strategy, in case individuals are sceptical over the purchase of an annuity with all their accumulated savings, they can opt for both options with a higher fraction on annuity products to reduce their risk exposure to annuity, and finally, individuals are advised not to opt for programmed withdrawal with all their accumulated savings since it is the least attractive of all the withdrawal options.

This study suggests to researchers interested in furthering on this work to look into areas such as the introduction of various withdrawal options that may result in better retirement benefits for retirees, and ways in which the risk bore by employees on the pension funds would be minimised.

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APENDIX

Appendix 1:Time series forecast with ARMA(5, 3)

Year	Forecast	Year	Forecast	Year	Forecast	Year	Forecast
2004	10.01	2024	16.11	2044	17.01	2064	17.28
2005	11.57	2025	12.94	2045	14.57	2065	16.45
2006	8.55	2026	15.26	2046	15.99	2066	18.97
2007	6.56	2027	15.56	2047	12.91	2067	18.69
2008	15.06	2028	14.93	2048	14.46	2068	21.92
2009	13.93	2029	9.23	2049	15.3	2069	20.2
2010	11.80	2030	11.56	2050	19.27	2070	20.43
2011	10.30	2031	12.68	2051	17.57	2071	17.55
2012	12.00	2032	14.62	2052	18.88	2072	18.84
2013	8.00	2033	13.21	2053	17.1	2073	16.99
2014	8.00	2034	17.72	2054	17.44	2074	19.3
2015	9.55	2035	16.96	2055	13.82	2075	19.36
2016	17.13	2036	15.61	2056	15.72	2076	22.65
2017	14.05	2037	11.65	2057	15.99	2077	21.14
2018	12.51	2038	14.1	2058	19.06	2078	22.13
2019	12.35	2039	12.72	2059	18.03	2079	19.63
2020	14.42	2040	13.97	2060	20.65	2080	20.36
2021	8.36	2041	14.25	2061	18.94		
2022	8.87	2042	19.03	2062	18.85		
2023	11.81	2043	17.35	2063	15.49		

Source: Author's computation